Concept of Reverse Electro Dialysis Power generation and its scope in IndiA.

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Abstract: This study has been taken to investigate on the concept of reverse electro dialysis in power generations and scope of establishing the plant in India. In this paper the required theory for the establishment of plant is given clearly and also the power generation at different percent of efficiency.

IndexTerms - **reverse electro dialysis, membranes,series battery..**

I. INTRODUCTION

We know that fossils are not sustainable . On consumption they produce large amount of harmful gases like carbon dioxide , carbon monoxide, and many . This causes global warming . In addition to this we are implementing thermal power plants and nuclear power plants for the increase of production of electricity.   This may leads to increase of green house gases in environment. So the osmotic power generation came into act. Reverse electro Dialysis is a process of production of electricity by means of difference in concentration of salts. This salt concentration may be differ in form of sea water vs river water or may be some industrial waste water vs fresh water. On an average of 12,328.4 meter cube per second of water is getting run into sea in India. We make use of this river water to sea to produce electricity.

II. PRINCIPLE:

There are two principles in reverse electro dialysis . One is for osmosis and other for power production. Here we use
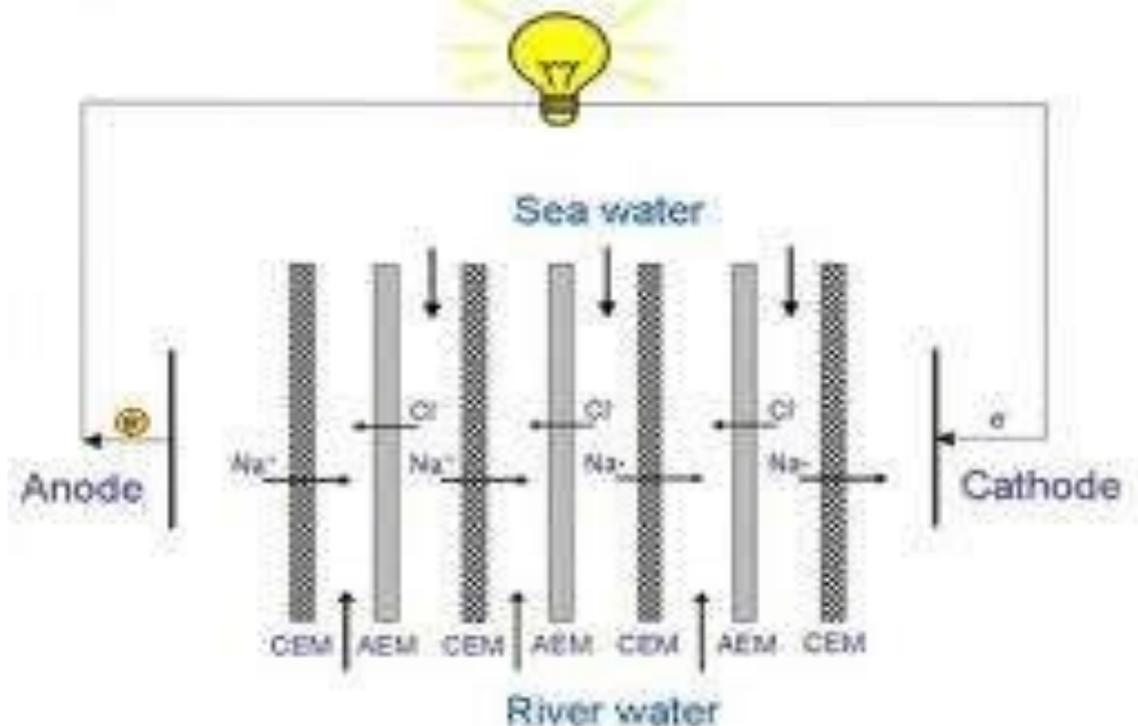
Two types of mem \branes : cation exchange membranes and anion exchange membranes . These membranes separated by certain distance, in this space sea water and river water are allowed. The salts in sea water are separated by the exchange membranes and form a battery like structure. This will give us electricity.

III. CONSTRUCTION:

The best place for the construction of reverse electro dialysis power generation plant is Estuary. Estuary is a point or area at where river meets sea or ocean. Because at this place the availability of river water and sea water is easy. Comming to the membranes used they are selected based on the Theotical calculations, performance required and amount of power to be generated.we can also establish near industries because the industrial waste water contains salts mostly preferred at chemical industries. Because the water from chemical industries have high concentration of salts.

IV. Theoretical calculations:

The reverse electro dialysis contain a series of cation and anion exchange membranes placed in alternatively. Between these membranes sea water and river water are fed . The ions are separated and form a series battery like structure. The theoretical study of salinity gradient power in reverse electro dialysis is based on kirchhoff's law.

The potential generated can be given as :

$$V = (2NRT*\ln(c/a))/F$$

Where V is potential generated , N number of sets of exchange membranes, R is universal gas constant , T is absolute temperature , c is activity in concentrated salt solution , a is activity of diluted salt solution and F is faraday constant.

The power output can be calculated as:

$$\text{Power} = r*I^2$$
$$= r*V^2/(r+s)^2$$

Where r is resistance of external load and s is resistance of stack. We get maximum power output when r=s . Then

$$\text{Maximum power} = V^2/(4r)$$

Coming to power density , it is defined is power output per unit membrane area. It can be given as

$$\text{Power density} = V^2/(4Ar)$$

Where A is membrane area.

IV. SCOPE IN INDIA:

India has sea on three sides and has many rivers like Ganga , godavari , krishna, and many more with high water discharge. The water from these rivers can be used for this produce. And also India is a developing country so the industrial growth is also happens. As the chemical industrial waste have high percentages of salts it can also be used for the power production.

From the project reports of danny , the estimated power production for 1 m^3 of sea water and 1 m^3 of river water is 0.74 MJ (if salinity gradient ratio is 1:50 and it works with 100% efficiency.).

Name of river	Discharge in m^3/sec	Merge in	Power output at 100% efficiency in MW	Power output at 1% efficiency in MW
Godavari	3505	Bay of Bengal	2593.7	25.93
Krishna	2213	Bay of Bengal	1637.6	16.37
Mahanadi	2119	Bay of Bengal	1568	15.38
Narmada	1447	Arabian sea	1070.78	10.70
Cauvery	677	Bay of Bengal	500.98	5.0098
Tapti	489	Arabian sea	361.86	3.61

These are some of major rivers in India with high discharge in India. From the above table it is clear that the power production

ranges from 77.32 MW to 7.73GW.

V. Conclusion:

By the establishment of a reverse electro dialysis power generation plant the major advantages are No harmful emission,Water to sea can be useful,Not effected by climate fluctuations. This may reduce the global warming.   Beyond the cost of establishment and membranes are high, this is renewable energy source. We can use this source for as many years the rivers and sea exist. As India is a developing country many industries are going to establish in India so that the power from this process can be used for the industry itself. This may reduce the usage of power can be reduced.

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